

## TIMBER CRUISING

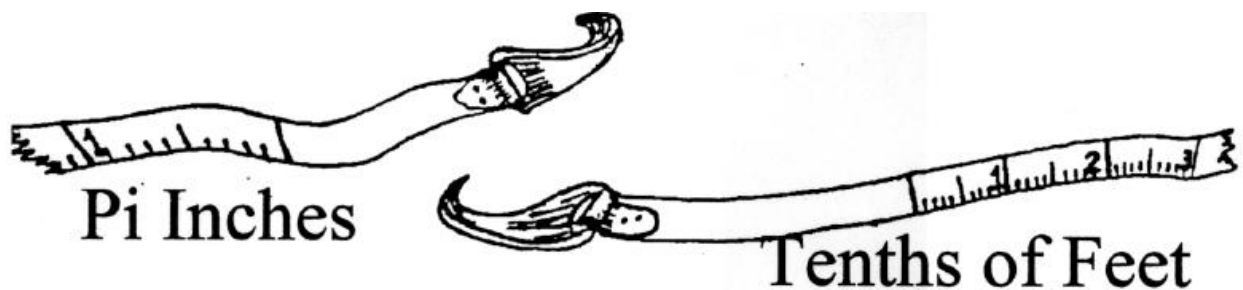
Timber cruising is the method that foresters use to determine the board foot volume of a standing tree and the amount of timber in a forested tract.

Two basic tree measurements are required in order to measure the board foot content of a standing tree. The **diameter** of the tree is measured at *4½ feet above the ground*. This is called the “diameter at breast height” and is commonly referred to as **d.b.h.** The **height** of a tree includes the *total height from ground level to the top of the tree*. After determining the diameter at breast height and the total height of the tree, a Board Foot Volume Table is used to compute the **board foot volume**. A board foot is equal to the volume of a board measuring 12 inches by 12 inches by 1 inch.

Let’s take a closer look at the three steps involved in calculating the board foot volume of a tree:

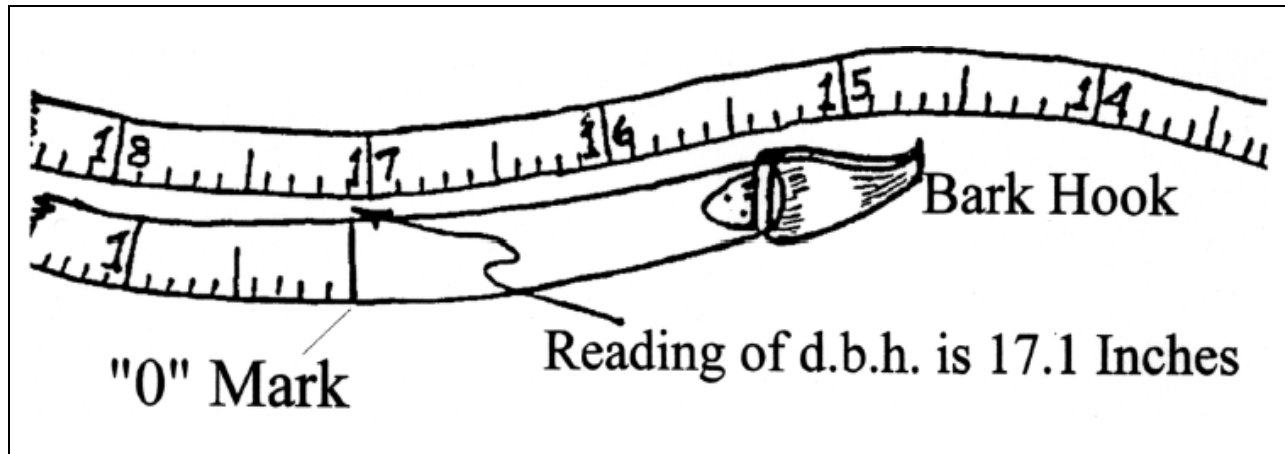
### MEASURING TREE DIAMETER AT BREAST HEIGHT

A **diameter tape** is a commonly used tool for measuring d.b.h. A D-tape usually has a hook on the end to help attach it to the bark so the tape can be more easily wrapped around the circumference of the tree. A diameter tape differs from a normal measuring tape (12 inches or tenths of feet) in that it is calibrated in “Diameter Equivalents of Circumference in Terms of Inches” (a.k.a “Pi Inches”). Basically, this scale allows the user to determine the diameter of a tree simply by measuring the circumference. In other words, measuring with Pi Inches calibration eliminates the need to divide a “tenths of feet” circumference measurement by Pi (3.1416) to calculate diameter.



*Note:* A logger’s tape is often used by foresters to measure both d.b.h. and tree height because one side is calibrated in Pi Inches while the other side is calibrated in feet and tenths of a foot (for measuring distance from the tree or other distances).

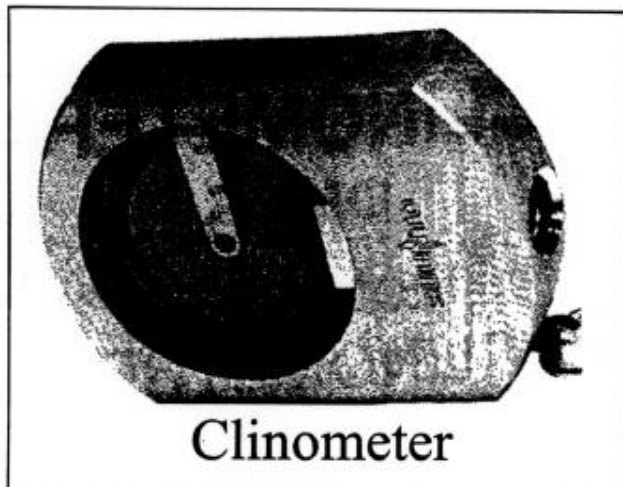
To measure d.b.h., first measure 4½ feet up the tree from the ground line (i.e. to “breast height”). Next, place the diameter tape’s hook into the bark at that height and extend the tape counterclockwise around the tree, making sure to keep the tape level. Finally, read the tree diameter where the tape crosses the “zero” line (located on the tape next to the hook), as illustrated below.



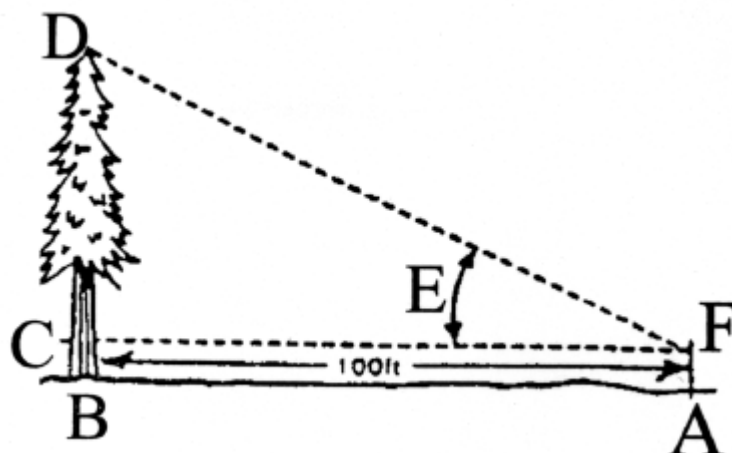
Example of diameter tape in use on a tree

## MEASURING TOTAL TREE HEIGHT

A **clinometer** is a tool used to measure total tree height. With a little practice, you will be able to accurately determine the height of a tree. To use the clinometer, hold it up to your eye (with the lanyard ring below the lens opening). Keeping both eyes open, simultaneously look through the lens and alongside the clinometer’s housing to the target. By an optical illusion, the horizontal sighting line will appear to project outside the clinometer’s housing. Place the projected sighting line on your target and read the adjacent scale.



**Example of Clinometer Use when the task is to measure the height of a tree on level ground using the percent (%) scale of the clinometer:**



100 feet is the most convenient baseline distance if you are using the **percent scale** on the clinometer. Back away from the tree 100 feet (from **C** to **F** or **B** to **A** on the diagram above). Sight the top of the tree (**D**) and read the percent (%) scale. This reading represents the height of the tree from *eye level* (0% slope) to the top of the tree (i.e. from **C** to **D**). Now, sight on the base of the tree and read the percent scale again. This reading represents the height from *eye level* down to the base of the tree (**B** to **C**). Add this reading to the first reading you took. This will give you the total tree height (i.e. the distance from **B** to **D**).

If you are measuring a tree in dense underbrush where it is difficult or impossible to see the top or base of the tree at 100 feet, you might want to use the **topo scale** (the other scale on the clinometer). To measure tree height using this scale, you will use the same procedure described in the example above, except that you will stand only **66 feet** away from the tree (instead of 100 ft.) and you will read the topo scale (1/66 feet) on the clinometer instead of the percent scale.

## **DETERMINING BOARD FOOT VOLUME**

A volume table gives the number of board feet in a tree. This is an estimate of the amount of lumber that can be cut from an individual tree. On the next page is a board foot volume table similar to the one used at the Forestry Contest.

## SCRIBNER BOARD FOOT VOLUME TABLE

DBH	TOTAL HEIGHT (feet)																
	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
8	11	15	18	24	27	32	35	41	44	49	53	60	65	72			
9	16	20	25	30	35	39	43	50	55	60	64	70	77	92	101		
10	21	26	32	38	43	49	54	61	65	69	76	88	97	108	119		
11	27	34	41	47	54	62	69	75	78	90	101	109	116	131	146	160	
12	33	42	50	58	65	76	80	93	102	112	122	134	151	165	178	185	
13	40	48	56	68	74	85	95	113	129	136	143	160	174	183	196	211	119
14	46	55	74	82	93	115	129	143	155	161	173	187	201	213	224	238	252
15	53	71	88	99	119	134	150	164	178	189	210	221	232	246	259	272	285
16	70	102	113	124	136	153	170	184	200	220	235	250	265	280	296	314	330
17	99	109	128	142	157	175	193	210	231	247	264	285	297	312	326	348	370
18	106	121	138	164	179	195	214	236	257	275	294	311	329	343	367	389	411
19	118	132	159	173	194	216	238	261	284	302	317	340	363	383	403	428	453
20	129	153	171	192	213	237	263	286	311	333	355	376	397	419	440	467	494
21	144	168	186	208	232	265	287	312	338	363	387	406	430	456	481	512	533
22	165	184	204	230	255	279	315	340	366	393	420	445	470	495	520	552	584
23		201	222	248	271	309	334	367	397	424	462	485	506	535	564	596	628
24			244	268	293	331	370	399	428	464	489	520	541	572	607	639	667
25				290	318	366	405	434	467	492	522	549	583	617	650	678	703
26				315	351	402	436	463	496	528	555	586	628	658	689	710	737
27					399	431	458	490	524	562	594	631	667	694	724	752	774
28					424	456	483	519	558	587	615	657	690	722	765	791	822
29						481	515	549	582	606	639	675	719	758	786	818	849
30							547	578	604	635	668	701	742	775	808	834	860

To use the table, look down the d.b.h. column (on the left side) to find the d.b.h. to the *nearest inch* of the tree you measured. Then look across the tree height line to find the height to the *nearest five feet* of the tree you measured. Look down that column – the point where it intersects with the d.b.h. row is the board foot volume of your tree.

### ***Contest Tip #1: Rounding Tree Heights***

#### **Tree heights are listed in 5-foot increments in the volume table**

Therefore, round your tree height measurement to the nearest 5-foot increment. For example, if you measure a tree as 78 feet tall, you will need to round down to the 75 ft. tree height when using the volume table to determine its volume. For a tree measuring 86 to 90 feet tall, round up to the 90 ft column to determine its volume from the table. A 90 to 94-ft. tree should be rounded down to 90.

### ***Contest Tip #2: Rounding Diameters***

#### **D.B.H. is given in 1-inch increments in the volume table**

The standard practice for rounding diameters at the Forestry Contest is as follows: Trees between 11.6 inches and 12.5 inches d.b.h. are included in the 12-inch diameter class. The 14-inch diameter class will include trees between 13.6 inches and 14.5 inches d.b.h. (and so on).

**Use these sample questions to practice using the volume table** [correct answers are given at the bottom of the page]:

A tree has a d.b.h. of 20.0 inches and a total height of 100 feet. Read down the d.b.h. column to “20” and then read across the tree height row to “100.” What is the board foot volume of this tree?\*

How many board feet would be contained in a tree that measures 14.4 inches d.b.h. and 73 feet tall?\*\*

What is the board foot volume of a tree that is 88 feet tall and 16.7 inches d.b.h.?\*\*\*

\*Answer 1 is 355 board feet.

\*\*Answer 2 is 93 board feet.

\*\*\*Answer 3 is 231 board feet.